National Institute of Environmental Health Sciences

Health risks from large-scale water pollution: Trends in Central Asia

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Abstract:

Limited data on the pollution status of spatially extensive water systems constrain health-risk assessments at basin-scales. Using a recipient measurement approach in a terminal water body, we show that agricultural and industrial pollutants in groundwater-surface water systems of the Aral Sea Drainage Basin (covering the main part of Central Asia) yield cumulative health hazards above guideline values in downstream surface waters, due to high concentrations of copper, arsenic, nitrite, and to certain extent dichlorodiphenyltrichloroethane (DDT). Considering these high-impact contaminants, we furthermore perform trend analyses of their upstream spatial-temporal distribution, investigating dominant large-scale spreading mechanisms. The ratio between parent DDT and its degradation products showed that discharges into or depositions onto surface waters are likely to be recent or ongoing. In river water, copper concentrations peak during the spring season, after thawing and snow melt. High spatial variability of arsenic concentrations in river water could reflect its local presence in the top soil of nearby agricultural fields. Overall, groundwaters were associated with much higher health risks than surface waters. Health risks can therefore increase considerably, if the downstream population must switch to groundwater-based drinking water supplies during surface water shortage. Arid regions are generally vulnerable to this problem due to ongoing irrigation expansion and climate changes. © 2010 Elsevier Ltd.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Chemical

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: Other Asian Region, Other Asian Country

Other Asian Region: Aral Sea Drainage Basin

Other Asian Country: Uzbekistan;Turkmenistan;Tajikistan;Kyrgyzstan;Kazakhstan;Afghanistan

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Dermatological Effect, Developmental Effect, Neurological Effect, Respiratory Effect, Urologic Effect

Developmental Effect: Cognitive/Neurological, Reproductive, Other Functional Deficit

Respiratory Effect: Upper Respiratory Allergy, Other Respiratory Effect

Respiratory Condition (other) : Shortness of breath

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☒

populations at particular risk or vulnerability to climate change impacts

Children

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content